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Dyer, IN Savage, MN Phoenix, AZ

October 6, 2005

Mayor Tom Arthur City of Brazil 203 East National Avenue Brazil, IN 47834

Dear Mr. Arthur,

M.E. Simpson Company is a technical service company that offers Leak Survey Programs, Large Meter Testing and Repair Programs, Water Main Location, and Valve Exercising, Location and Computer Mapping Programs. These "Technical Services" offered by M. E. Simpson Company are designed to aid a utility in reducing unaccounted for water and lost revenue.

M. E. Simpson Company is pleased to submit this report of our leak detection survey for the City of Brazil. This survey addressed the Brazil water distribution system, consisting of approximately 73 miles of water main. The report contains the results of our investigation that includes the following:

- 1. A DESCRIPTION OF THE AREA SURVEYED.
- 2. METHODOLOGY OF THE SURVEY.
- 3. A LIST OF LEAKS AND TYPE OF LEAK LOCATED.
- 4. GENERAL RECOMMENDATIONS BASED ON OUR INVESTIGATION.

#### DESCRIPTION OF THE AREA SURVEYED

Approximately 385,440 lineal feet were surveyed as part of the system investigation. This included all fire hydrants, all accessible mainline valves, and selected services.

#### **METHODOLOGY**

Your survey was conducted using the latest state of the art leak computers, the **FLUID CONSERVATION SYSTEMS' Tri-Corr 2001** the **90/90** or **C2000** with the **MP90** preamplifier-transducer system. All of these correlators are manufactured by Fluid Conservation Systems of Milford, Ohio. These electronic instruments are microprocessor units that measure the time it takes the sound of the leak to travel from the leak to the point where the leak correlator is connected to the water line. By connecting the leak correlator to the water line at two locations, it will compute the distance from the leak to each connection point thus enabling us to determine the exact leak location. Our experienced technicians used these devices, along with the **S20** electronically enhanced listening device, as listening equipment to survey your pipeline network. Each hydrant and accessible valve was used as listening points to identify leaks. One hundred services, b-boxes, were used on an as needed basis to keep the listening distances under five hundred feet (500'). All PVC style watermains were investigated via correlation. Correlation distances for PVC did not exceeding five hundred feet (500') unless listening points were unavailable. "**Pin-Pointing"** of the leak, as well as locating leaks that other methods fail to reveal was also done with this equipment.

#### LEAKAGE LOCATED

All water mains within the Project area were surveyed and 30 leaks were located. These leaks have been grouped as follows: Main Line Leak - 7, Service Line Leak - 1, Fire Service Leak-0, Valve Leak - 3, Hydrant Leak - 19, Other Type Leak - 0. All of these leaks have been verbally reported to your office with these locations, so many have probably been repaired already. Following are the leak locations with an estimated GPD (Gallons Per Day) leakage potential.

Туре	Location	SIZE
Main Line	25 Ridge Street	
	see enclosed diagram	12,960 GPD
Main Line	406 Ringo Drive	
	see enclosed diagram	7,200 GPD
Main Line	613 Columbia Street	
	see enclosed diagram	7,200 GPD
Main Line	Alabama Street & Compton Street	
	see enclosed diagram	7,200 GPD
Main Line	Johnson Street & Jackson Street	
	see enclosed diagram	7,200 GPD
Main Line	Leavitt Street & Posey Street	
	see enclosed diagram	7,200 GPD
Main Line	205 Epworth Street (S)	
	see enclosed diagram	4,320 GPD
Service Line	511 Locust Drive	
	see enclosed diagram	2,880 GPD
Valve	Tobe Sutherlin Lane & Nabuca Drive	
	see enclosed diagram	5,760 GPD
Valve	Chicago Avenue & Noble Street	
	see enclosed diagram	2,880 GPD
Valve (packing)	Meridian Street & Logan Street	
	see enclosed diagram	720 GPD
Hydrant	1619 - 1638 Stone Drive	
	see enclosed diagram	4,320 GPD
Hydrant	403 Sycamore Street	
	see enclosed diagram	2,880 GPD
Hydrant	Locust Drive & Magnolia Drive	
	see enclosed diagram	2,880 GPD
Hydrant	200 West & County Road 340	
	see enclosed diagram	1,440 GPD
Hydrant	Alabama Street & Hendrix Street	
	see enclosed diagram	1,440 GPD
Hydrant	Chicago Avenue & William Street	
	see enclosed diagram	1,440 GPD
Hydrant	Chicago Street & Noble Street	
	see enclosed diagram	1,440 GPD
Hydrant	Harrison Street & National Avenue	
	see enclosed diagram	1,440 GPD

Туре	Location	SIZE
Hydrant	National Avenue & MI Windows and Doors Company	
	see enclosed diagram **Fixed**	1,440 GPD
Hydrant	Walnut Street & Chestnut Street	
	see enclosed diagram	1,440 GPD
Hydrant	Walnut Street & Hendrix Street	
	see enclosed diagram	1,440 GPD
Hydrant	Warren Street & Central Street	
	see enclosed diagram	1,440 GPD
Hydrant	Warren Street & Logan Street	
	see enclosed diagram	1,440 GPD
Hydrant	1098 Deer Creek Drive	
	see enclosed diagram **Fixed**	720 GPD
Hydrant	Ashley Street & Olive Street	
	see enclosed diagram	720 GPD
Hydrant	Chicago Avenue & National Avenue	
	see enclosed diagram	720 GPD
Hydrant	Chicago Street & Posey Street	
	see enclosed diagram **Fixed**	720 GPD
Hydrant	Desart Street & North Street	
	see enclosed diagram	720 GPD
Hydrant	Leavitt Street & Center Street	
	see enclosed diagram	720 GPD
30 Leaks Located	ESTIMATED LEAKAGE TOTAL	94,320 GPI

#### LEAK QUANTITIES

Quantifying leaks is difficult because there is not any accurate means of doing so. Pipe material, size of the leak, system pressure, soil material and water table will effect the noise that a leak makes. Small leaks under high system pressure will make more noise than a large leak under low system pressure. However, the above leaks are of sufficient noise levels that the above estimates should be very conservative. Using an estimated price of \$1.00 per thousand gallons, these leaks were costing your utility in excess of \$94.32 per day or \$34,426 annually. It's obvious that this Leak Survey Program has proven to be cost effective. Naturally the main line leaks have the greatest potential for loss followed by service line, valves, and finally hydrants. Once leaks have been repaired, we would recommend that the Utility compare pumping rates before and after. This information will be more meaningful and accurate.

#### RECOMMENDATIONS

This survey confirms that the City of Brazil's water distribution system will benefit from this project by a reduction in underground leakage. There is always a concern over the cost effectiveness of leak detection because of the uncertainty of the number of leaks located. However, with your present cost of water and the discovery of these thirty leaks, the cost of this 2005 leak survey will pay for itself within six months. It only takes a recovery of about 49,041 gallons per day on an annual basis (49,041 gallons per day is only 34.1 gallons per minute throughout your entire water distribution system) to recover your investment. We would recommend that you conduct a Leak Survey Program every year. This recommendation becomes more critical as your cost of water increases.

We appreciate your cooperation and that of the utility staff who were available to answer our questions during this project. If you have any questions with the information in this report, please do not hesitate to call.

Sincerely Yours,

John H. Van Arsdel Marketing Manager

John H. Van hrodel

JHV/jph

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

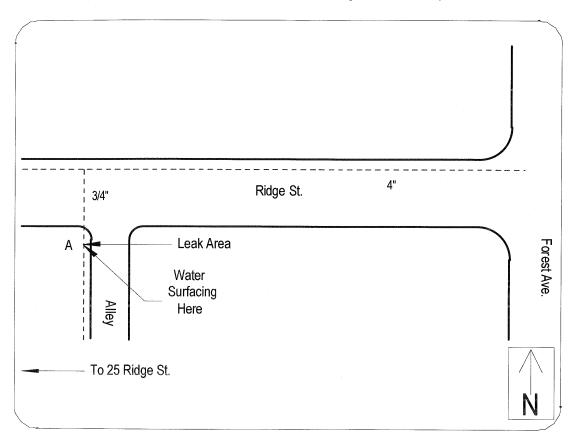
Time: 08:40

Date: Thursday, September 22, 2005

Tech: David C. & Eric B.

Address: 25 Ridge Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Area of 3/4" Main

**Connection point: Connection point: Connection point:** 

Leak Location: 0' from A

Comments: This is a leak on a 3/4" main. We notified the Utility and they were to repair

this leak immediately.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

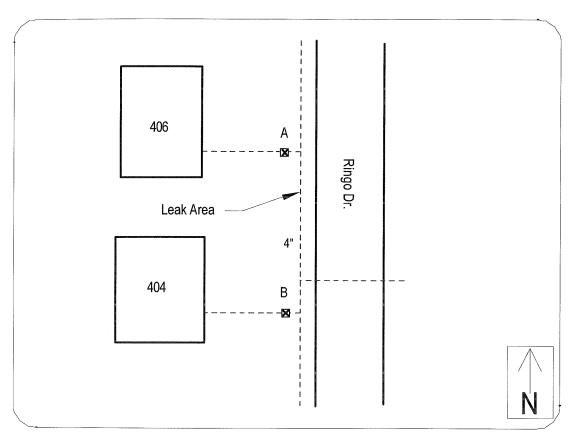
Time: 09:20

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: 406 Ringo Drive

Below is a diagram of the area surveyed for a suspect leak.



Distance: 75' from A to B

Connection point: A= Meter Pit
Connection point: B= Meter Pit

Connection point: Connection point:

Leak Location: 22' from A

Comments: This is a leak on a 4" main. The Utility was notified and will repair this leak.

### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

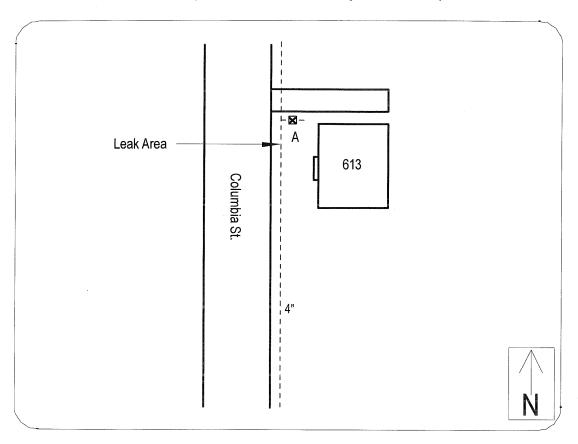
**Time:** 15:05

Date: Monday, September 19, 2005

Tech: David C. & Eric B.

Address: 613 Columbia Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Meter Pit

Connection point:
Connection point:
Connection point:

Leak Location: 15' from A

Comments: This is a leak on a 4" main.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

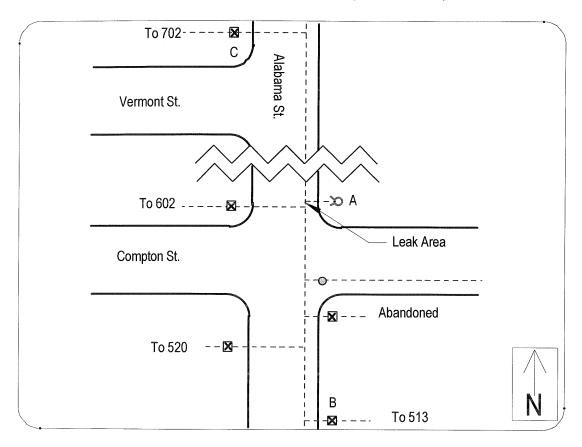
Time: 09:21

Date: Tuesday, September 20, 2005

Tech: David C. & Eric B.

Address: Alabama Street & Compton Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 132' from A to B / 266' from A to C

Connection point: A= Hydrant

**Connection point:** B= Meter for 513 **Connection point:** C= Meter for 702

**Connection point:** 

Leak Location: 13' from A

Comments: This is a leak on the main where it connects to the hydrant lead.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

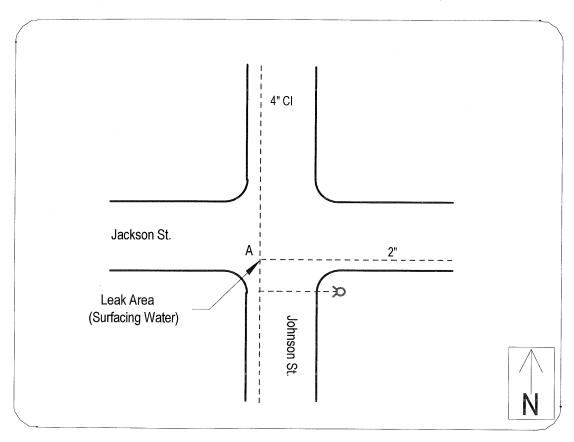
**Time:** 10:30

Date: Thursday, September 08, 2005

Tech: David C. & Eric B.

Address: Johnson Street & Jackson Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= On Main at Tee

**Connection point: Connection point: Connection point:** 

Leak Location: 0' from A

Comments: This is a main line leak. The Utility was notified and will repair this leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

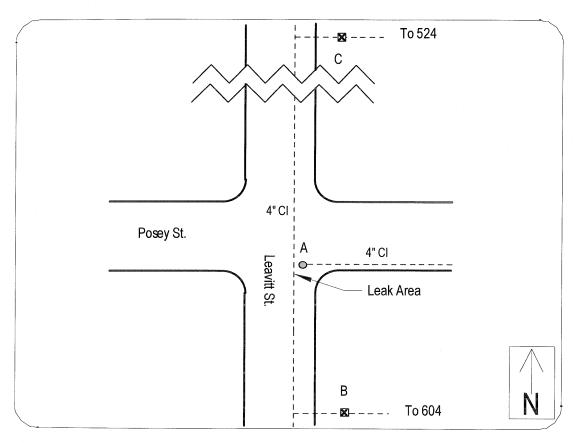
**Time:** 15:30

Date: Wednesday, September 21, 2005

Tech: David C. & Eric B.

Address: Leavitt Street & Posey Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 88' from A to B / 228' from B to C

Connection point: A= Main Line Valve
Connection point: B= Service for 604
Connection point: C= Service for 524

**Connection point:** 

Leak Location: 3' from A

Comments: This is a leak on a 4" main.

#### LEAK LOCATION REPORT

Client: Brazil, Indiana

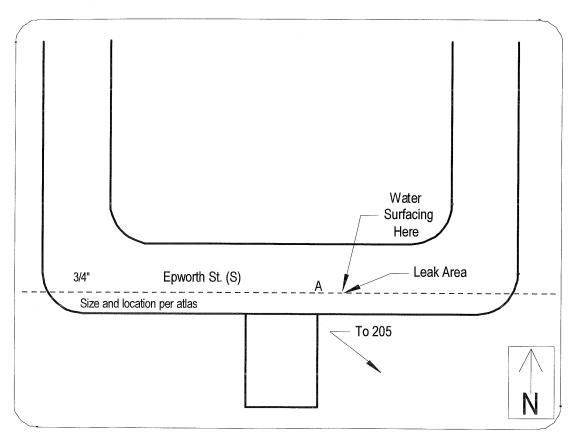
Time: 10:30

Date: Thursday, September 22, 2005

Tech: David C. & Eric B.

Address: 205 Epworth Street (S)

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Area of 3/4" Main

**Connection point: Connection point: Connection point:** 

Leak Location: 0' from A

Comments: This is a leak on a 3/4" main. The Utility has been notified.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

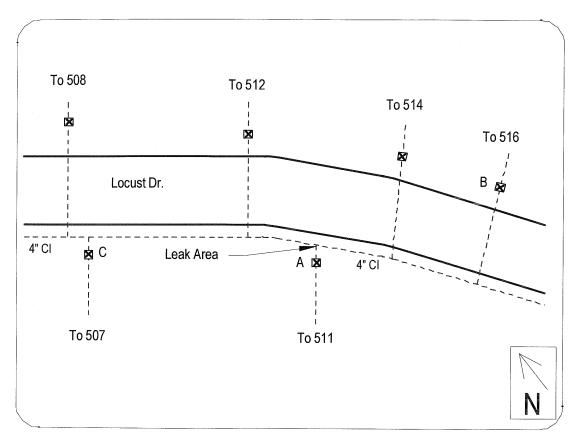
Time: 10:14

Date: Friday, September 16, 2005

Tech: David C. & Eric B.

Address: 511 Locust Drive

Below is a diagram of the area surveyed for a suspect leak.



Distance: 134' from A to B / 244' from B to C

Connection point: A= Meter Pit for 511
Connection point: B= Meter Pit for 516
Connection point: C= Meter Pit for 507

**Connection point:** 

Leak Location: 9' from A

Comments: This is a service leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

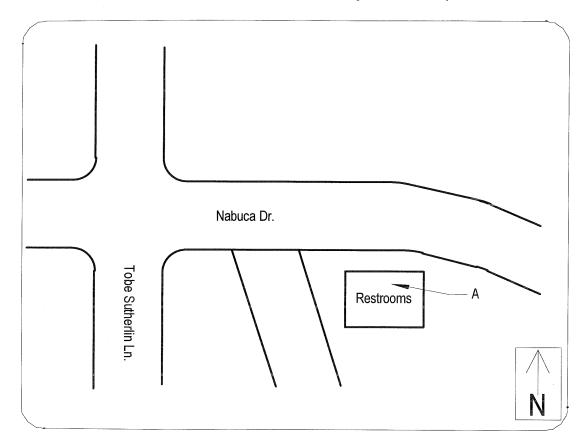
**Time:** 10:40

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Tobe Sutherlin Lane & Nabuca Drive

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Urinals in Men's Room

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a leak on the Sloan valves on the urinals. The valves are on full flush

at all times. This is unmetered water.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

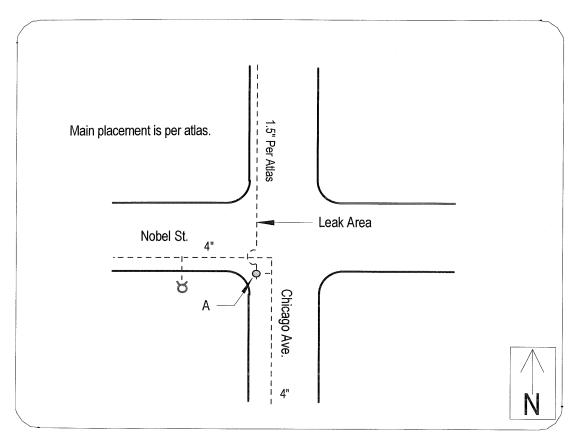
**Time:** 09:14

Date: Wednesday, September 21, 2005

Tech: David C. & Eric B.

Address: Chicago Avenue & Noble Street

Below is a diagram of the area surveyed for a suspect leak.



Distance:

Connection point: A= Valve

Connection point: Connection point: Connection point:

Leak Location: 17' from A

Comments: This is a valve leak. This leak is surfacing and the Utility has been notified.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

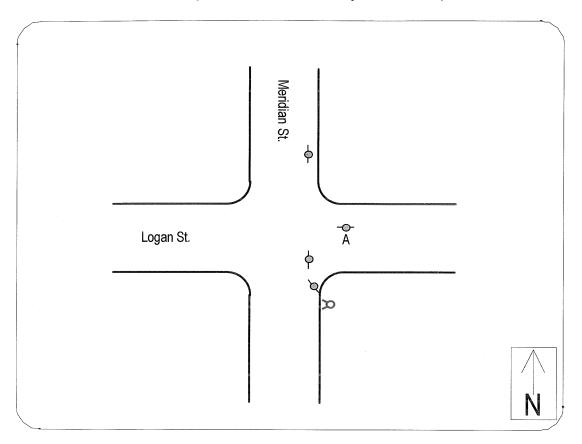
Time: 08:22

Date: Wednesday, September 21, 2005

Tech: David C. & Eric B.

Address: Meridian Street & Logan Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Main Line Valve

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a packing leak on a main line valve.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

**Time:** 09:51

Date: Friday, September 09, 2005

Tech: David C. & Eric B.

Address: 1619 - 1638 Stone Drive

Below is a diagram of the area surveyed for a suspect leak.

Distance: 0' from A

Connection point: A= Flush Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a leak on the flush hydrant. It could not be shut off. The Utility

removed the hydrant.

### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

**Time:** 08:27

Date: Monday, September 19, 2005

Tech: David C. & Eric B.

Address: 403 Sycamore Street

Below is a diagram of the area surveyed for a suspect leak.

Sycamore St.

A03

N

N

Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

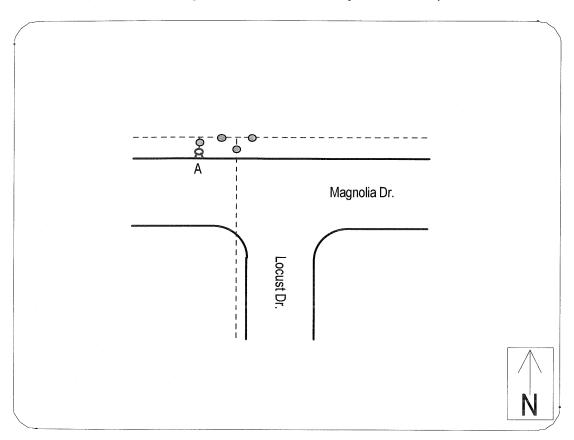
**Time:** 10:25

Date: Friday, September 16, 2005

Tech: David C. & Eric B.

Address: Locust Drive & Magnolia Drive

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

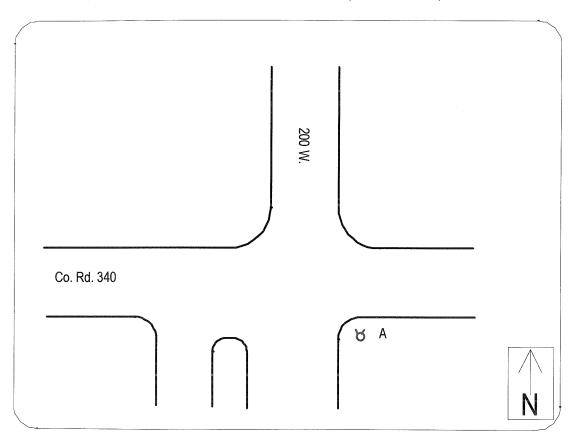
**Time:** 09:39

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: 200 West & County Road 340

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak. The rear body of hydrant was split to the bonnet.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

**Time:** 08:30

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Alabama Street & Hendrix Street

Below is a diagram of the area surveyed for a suspect leak.

Hendrix St.

Distance: 0' from A

Connection point: A= Hydrant

Connection point: **Connection point:** Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

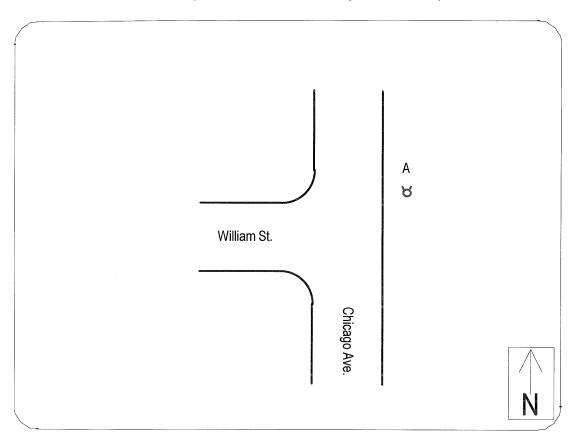
Time: 08:18

Date: Thursday, September 22, 2005

Tech: David C. & Eric B.

Address: Chicago Avenue & William Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

**Connection point:** A= Hydrant (Frost Free)

**Connection point: Connection point: Connection point:** 

Leak Location: 0' from A

Comments: This is a hydrant leak.

### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

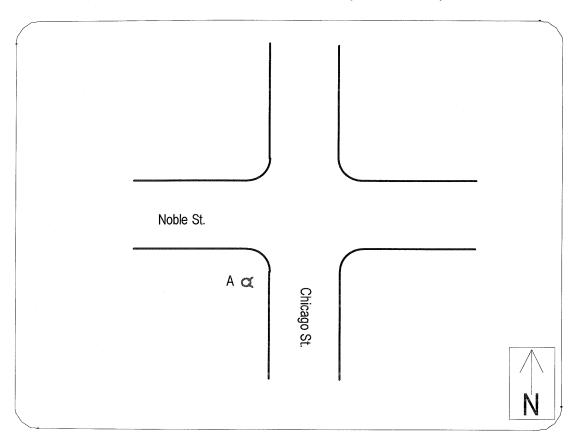
Time: 09:02

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Chicago Street & Noble Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

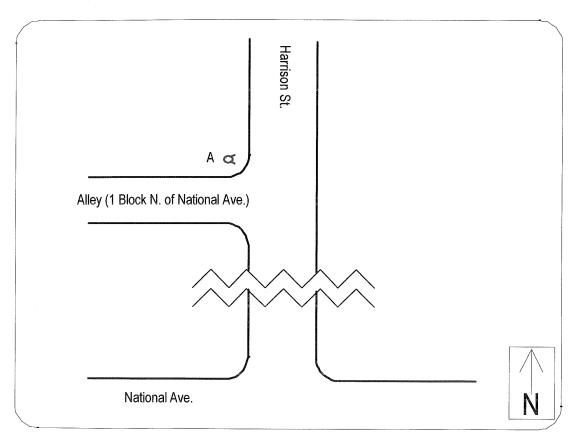
**Time:** 07:53

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Harrison Street & National Avenue

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

Time: 10:44

Date: Friday, September 16, 2005

Tech: David C. & Eric B.

Address: National Avenue & MI Windows and Doors Company

National Ave.

To MI Windows and Doors Company

Below is a diagram of the area surveyed for a suspect leak.

Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This was a hydrant leak. We tightened the hydrant top nut and the leak noise

quit. This leak is fixed.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

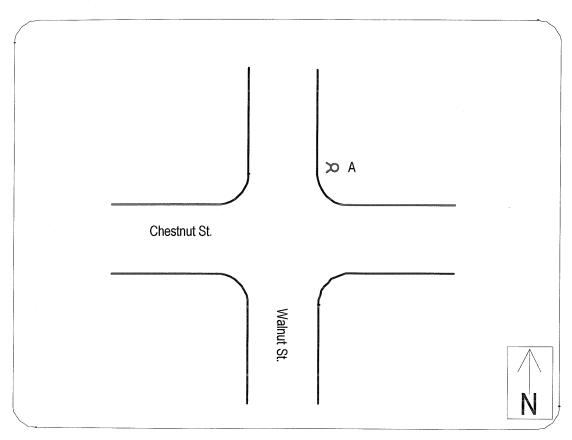
**Time:** 08:42

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Walnut Street & Chestnut Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

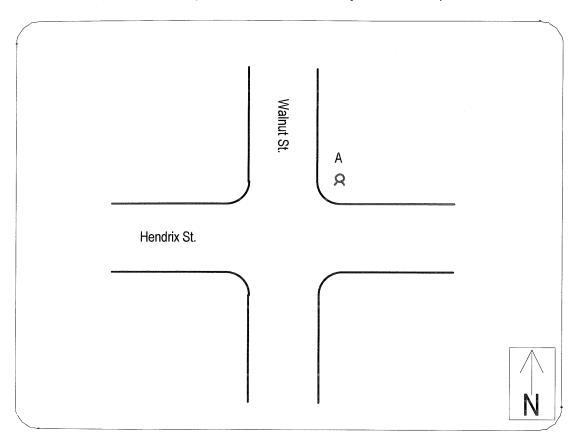
**Time:** 11:30

Date: Tuesday, September 20, 2005

Tech: David C. & Eric B.

Address: Walnut Street & Hendrix Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

**Connection point: Connection point: Connection point:** 

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

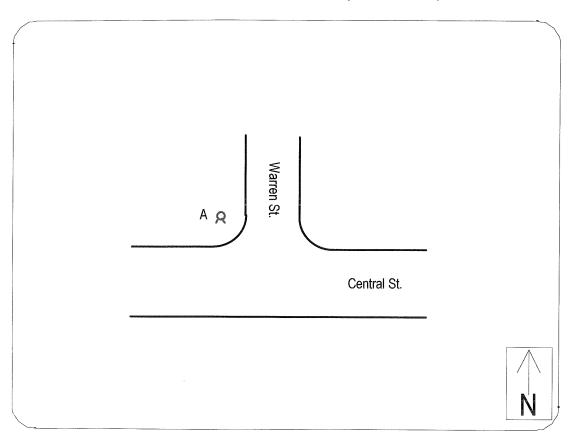
**Time:** 08:56

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Warren Street & Central Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

**Time**: 08:50

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Warren Street & Logan Street

Below is a diagram of the area surveyed for a suspect leak.

Logan St.

Warren St.

N

Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

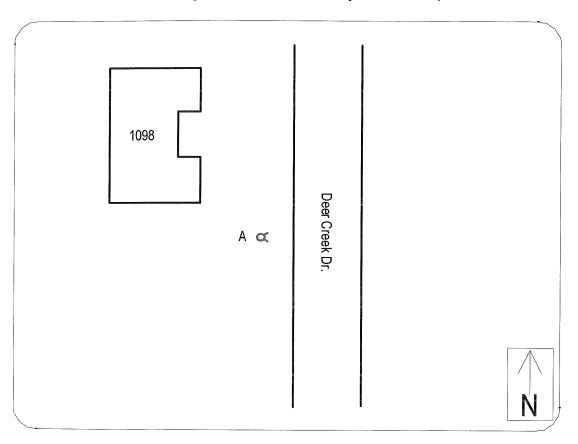
**Time**: 10:09

Date: Wednesday, September 21, 2005

Tech: David C. & Eric B.

Address: 1098 Deer Creek Drive

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This was a hydrant leak. We tightened the hydrant top nut and the leak noise

quit. This leak is fixed.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

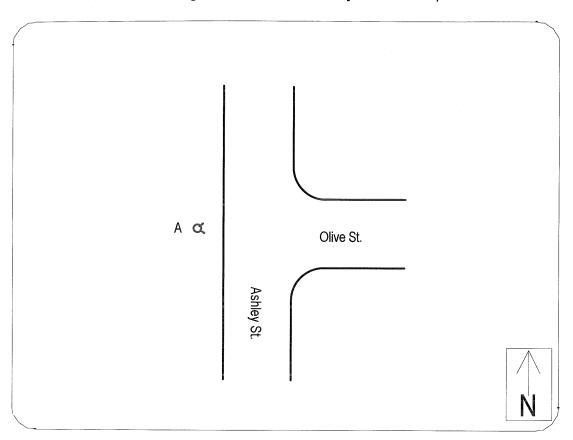
Time: 09:03

Date: Monday, September 19, 2005

Tech: David C. & Eric B.

Address: Ashley Street & Olive Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

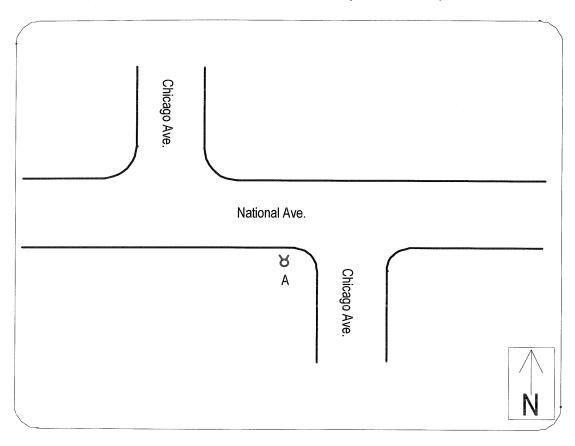
Time: 09:40

Date: Thursday, September 22, 2005

Tech: David C. & Eric B.

Address: Chicago Avenue & National Avenue

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

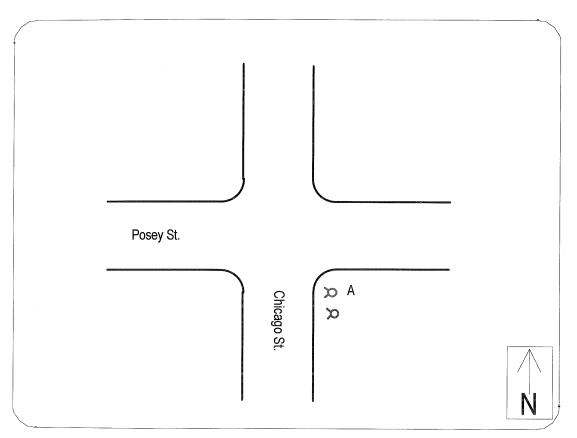
**Time:** 09:57

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Chicago Street & Posey Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This was a hydrant leak. We tightened the hydrant top nut and the leak noise

quit. This leak is fixed.

### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

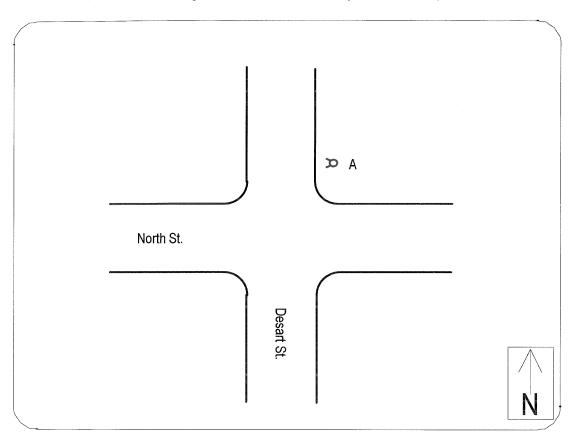
**Time:** 11:30

Date: Wednesday, September 21, 2005

Tech: David C. & Eric B.

Address: Desart Street & North Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

Connection point: A= Hydrant

**Connection point: Connection point: Connection point:** 

Leak Location: 0' from A

Comments: This is a hydrant leak.

#### **LEAK LOCATION REPORT**

Client: Brazil, Indiana

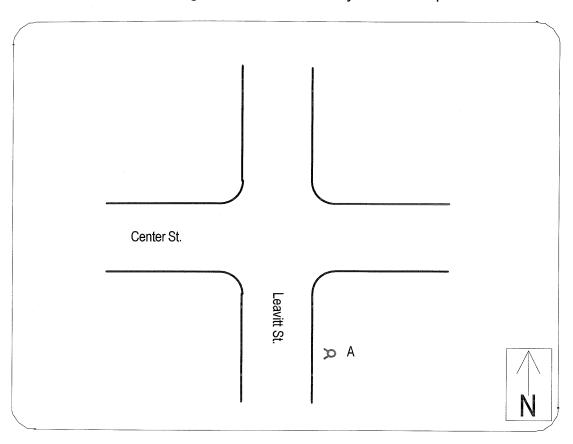
Time: 09:50

Date: Monday, September 12, 2005

Tech: David C. & Eric B.

Address: Leavitt Street & Center Street

Below is a diagram of the area surveyed for a suspect leak.



Distance: 0' from A

**Connection point:** A= Hydrant

Connection point:
Connection point:
Connection point:

Leak Location: 0' from A

Comments: This is a hydrant leak.